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F01 Climate Control

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Climate Control

Model: F01/F02

Production: From Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Describe the operation IHKA/FKA (4 zone) system used on the F01/F02
- Identify the components of the BMW IHKA/FKA system used on the F01/F02

Introduction

The F01/F02 heating and air conditioning system has been enhanced in terms of heating/cooling capacity, airflow distribution, noise and convenience when compared with the previous 7 Series system.

The F01/F02 will only be available with IHKA 4 zone (IHKA with FKA). The new 4 zone IHKA system is similar (in operation) to the system used on E70 and E71 vehicles.

The (IHKA) Integrated automatic climate control with rear climate control (FKA) is a 4-zone system.

Regardless on the equipment option selected, all essential climate control functions are individually accessible by each occupant.

IHKA integrated automatic climate control on F01/F02



IHKA (4 zone)

System Overview

The IHKA 4 zone has an additional control panel and control unit in the rear passenger compartment (FKA) allowing the rear passengers full control of temperature, air flow rate and airflow distribution with a choice of 5 intensity levels.

The IHKA 4 zone system is equipped with 15 stepper motors.

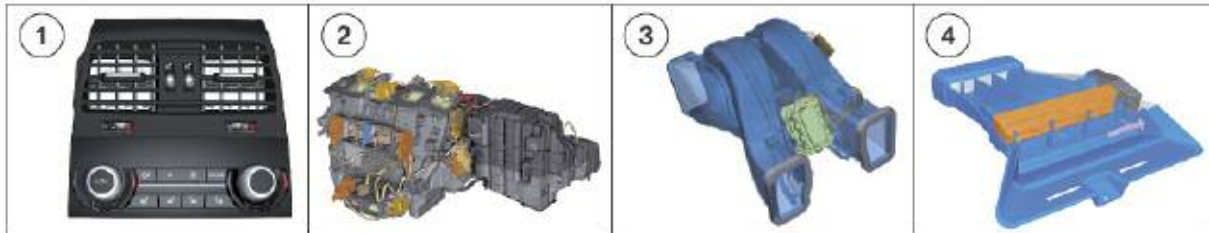
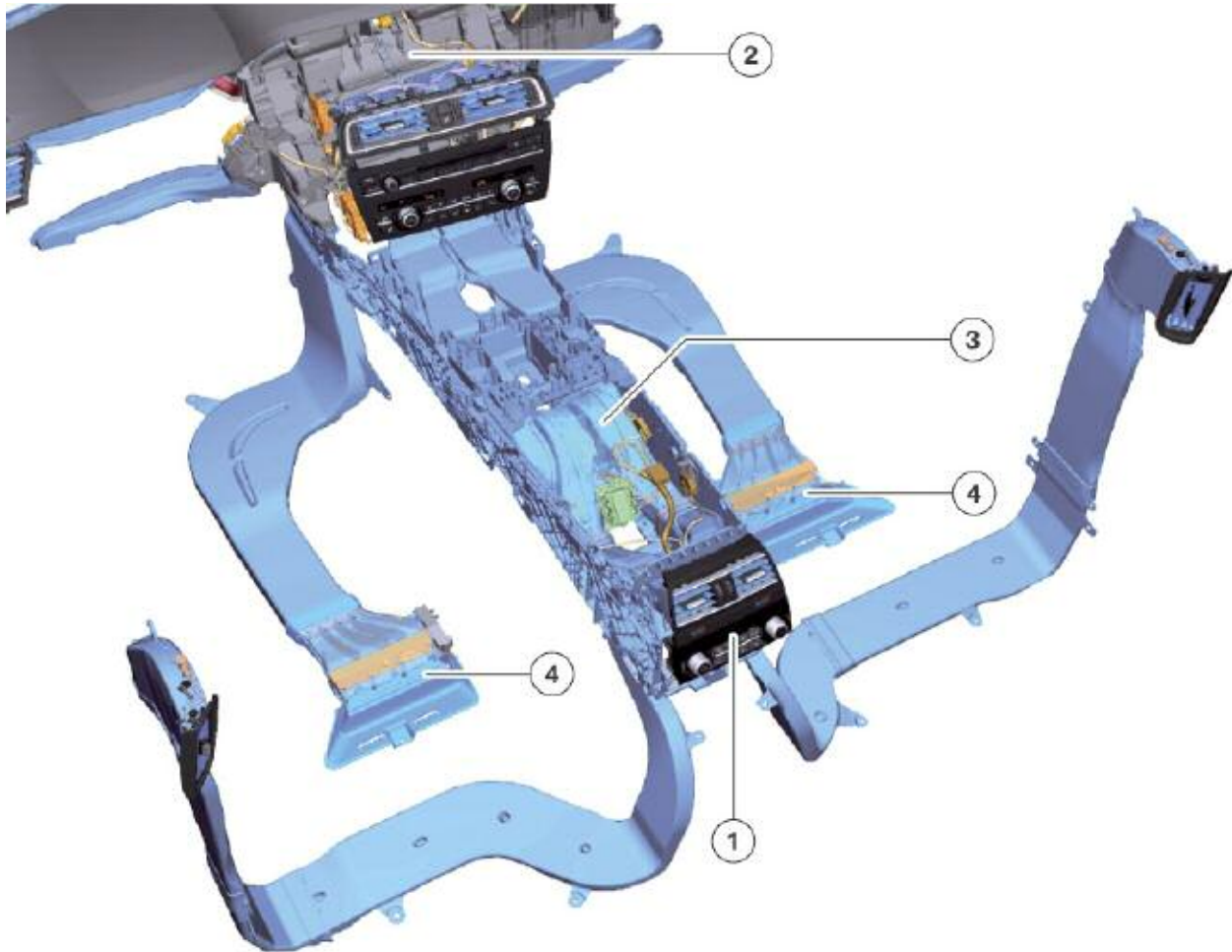
There is an extra blower fan located in the center console to enhance the air flow in the rear passenger compartment.

The rear footwell ducts are each fitted with a PTC heater element to warm up the outlet air temperature. They are individually adjusted depending on the rear passengers requested temperature settings.

The rear occupants can also adjust the air temperature from the rear center air vent and the left and right B-pillar vents by means of two stratification adjusters (potentiometers) located on the rear center air vent.



Control panel for IHKA with FKA rear climate control with IHKA 4 zone.



Index	Explanation	Index	Explanation
1	Control panel for FKA rear climate control and center rear air vent	3	FKA fan in center console
2	IHKA climate-control housing with 15 stepper motors	4	Left/right rear footwell PTC heater elements

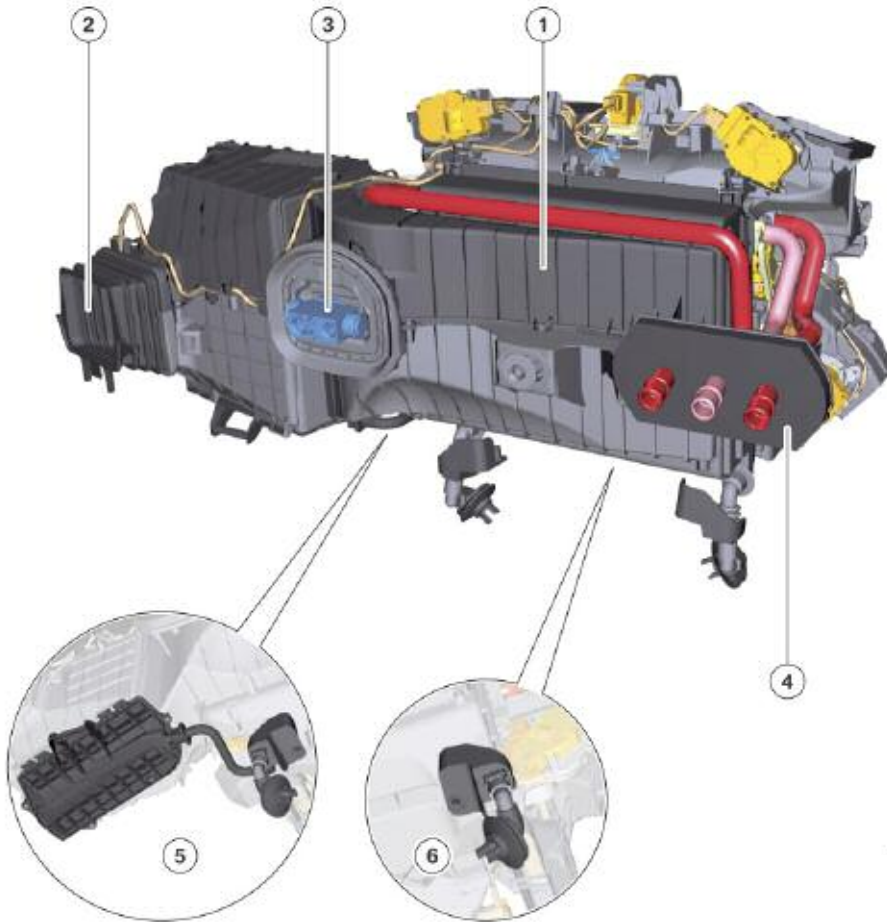
System Air Flow

The air flows through a flap between the fan motor and the climate control housing into the filter housing of the IHKA.

In the filter housing, the air is filtered by two combination filters (with activated charcoal) whether it is fresh air or recirculated air, it then flows on to the evaporator and heater core.

Depending on the IHKA settings and the in side and outside temperature, the air is initially cooled and dried by the evaporator and, if necessary, then re-heated by the heater core to deliver the requested outlet temperature.

F01/F02 Climate Control Unit

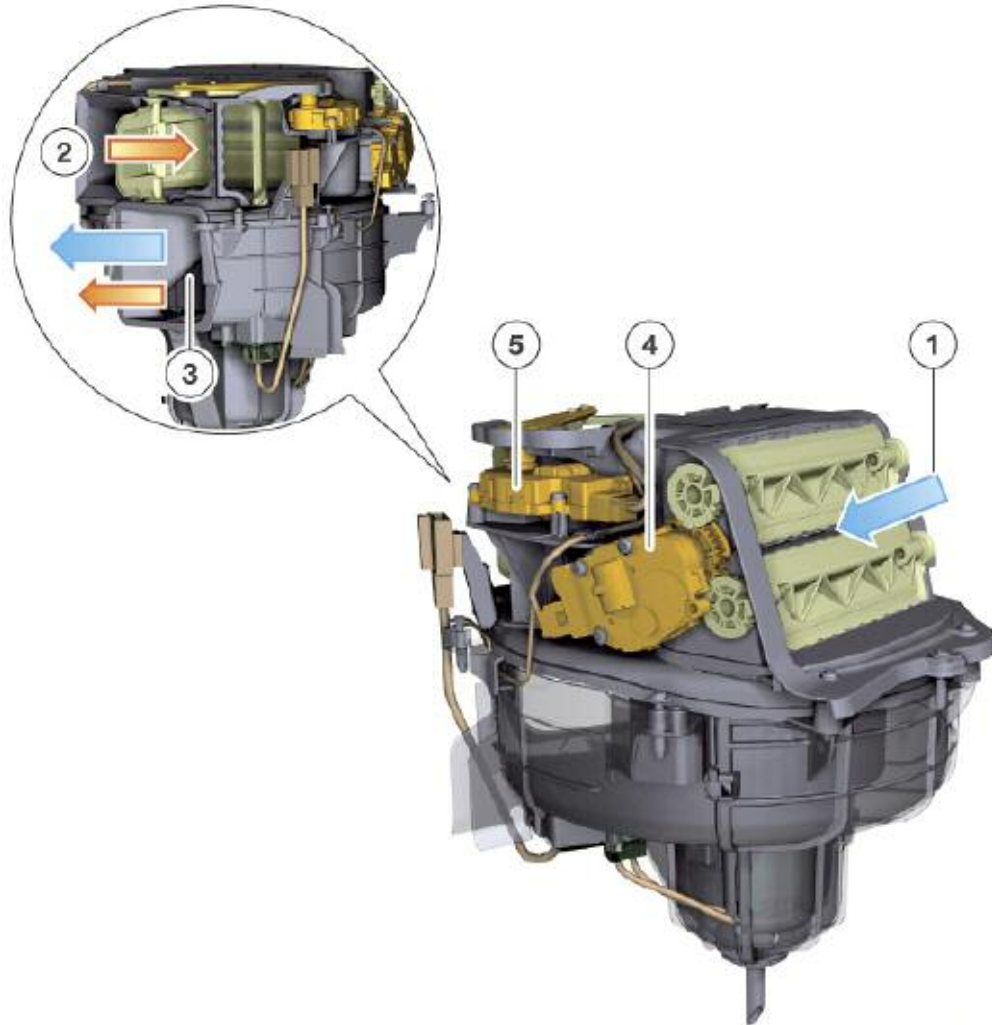


Index	Explanation	Index	Explanation
1	F01/F02 climate control housing	4	Pipe connections for heater core
2	Air inlet via flap	5	Right condensation drain from filter housing and climate control unit
3	Connection for refrigerant circuit/expansion valve	6	Left condensation from climate control housing

IHKA Blower Fan

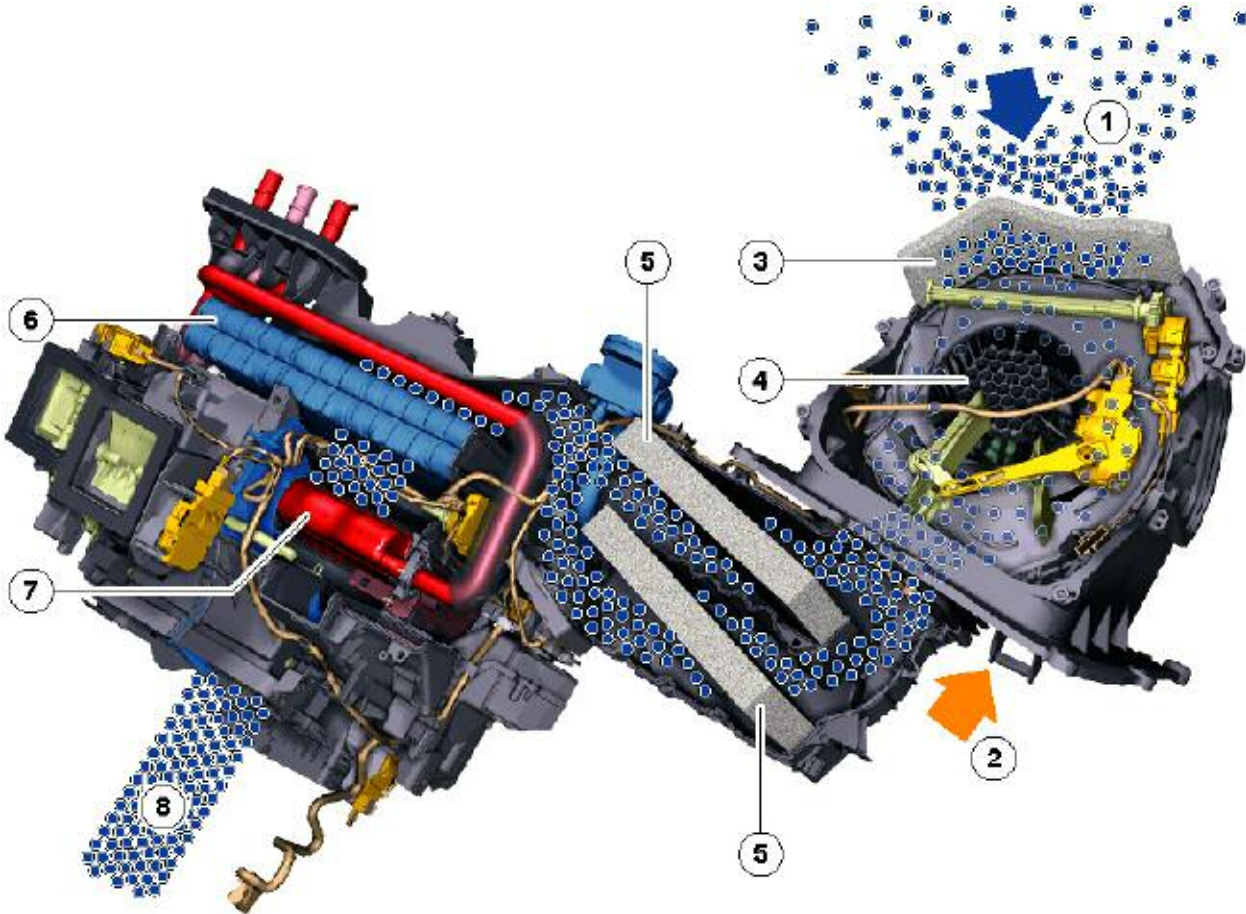
The fan draws in the recirculated air from the passenger compartment through an opening in the bulkhead.

Climate Control Air Intake Assembly on F01/F02



Index	Explanation	Index	Explanation
1	Fresh air intake	4	Fresh-air/ram-air stepper motor
2	Recirculated-air intake	5	Recirculated-air stepper motor
3	Air outlet via gaiter to climate control housing		

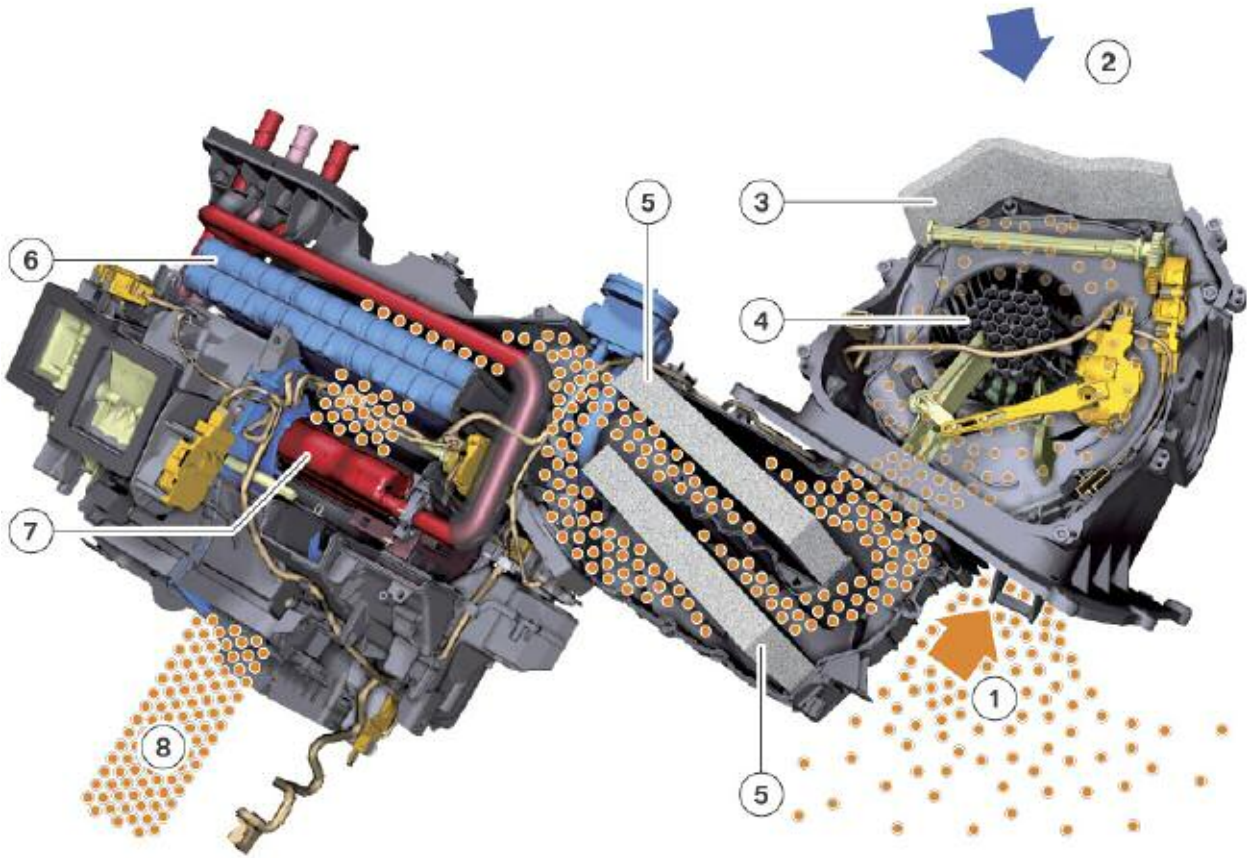
Fresh Air Intake



Top View of the Fresh Air Intake Path in the IHKA Housing on F01/F02

Index	Explanation	Index	Explanation
1	Fresh air intake via coarse filter to climate control fan	5	Two combination filters (activated charcoal)
2	Recirculated-air intake	6	Evaporator
3	Coarse filter in fan-motor housing	7	Heater core
4	Climate control system fan	8	Air outlet to air ducts and passenger compartment

Recirculated Air Intake



Top View of the Re-circulated Air Intake Path in the IHKA Housing on F01/F02

Index	Explanation	Index	Explanation
1	Re-circulated air intake from passenger compartment through opening in engine compartment bulkhead	5	Two combination filters (activated charcoal)
2	Fresh air intake	6	Evaporator
3	Coarse filter in fan-motor housing	7	Heater matrix
4	Climate control system fan	8	Air outlet to air ducts and passenger compartment

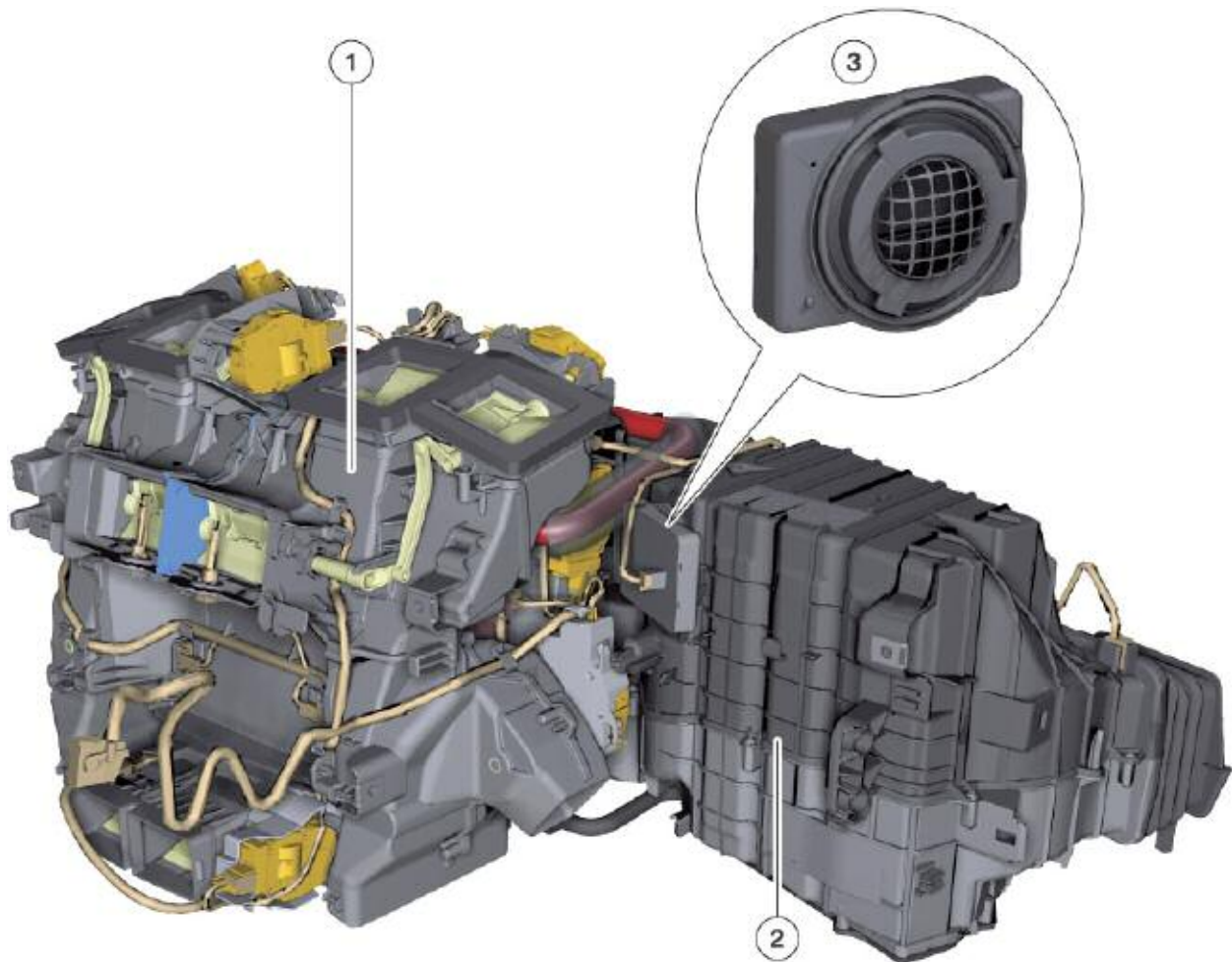
Air Ionizer

The air ionizer used in the F01/F02 is the latest technical innovation in the area of heating and air conditioning.

The air ionizer is positioned upstream of the evaporator and it is activated as necessary when the vehicle is stationary.

By partial ionization of the air the formation of bacteria on the evaporator surface and the associated odor is prevented.

Air ionizer on F01/F02



Index	Explanation	Index	Explanation
1	F01/F02 climate-control unit	3	Air ionizer
2	Filter housing		

The air ionizer is a separate component which fits onto the climate-control unit with bayonet connection and is positioned in the air stream to the evaporator.

It essentially consists of a planar module, a flat ceramic plate which is covered by hard glass with printed electrical conductors located on the front and back of the component.



Air ionizer on F01/F02

Applying a high voltage generated internally in the ionizer partially ionizes the air.

The chemical reaction between the ionized air and the condensed water produces hydrogen peroxide in the evaporator housing, which kills bacteria and germs on the evaporator and thus prevents the formation of unpleasant odors that could enter the vehicle interior.

The IHKA decides when and whether to operate the air ionizer, based on the ambient and operating conditions of the climate control system.

The air ionizer is operated for a period of several minutes by a control signal from the IHKA.

Operation takes place as required only during the overrun period after Terminal 15 is turned OFF and the vehicle is locked.

The maximum power consumption of the unit is 850 mA.

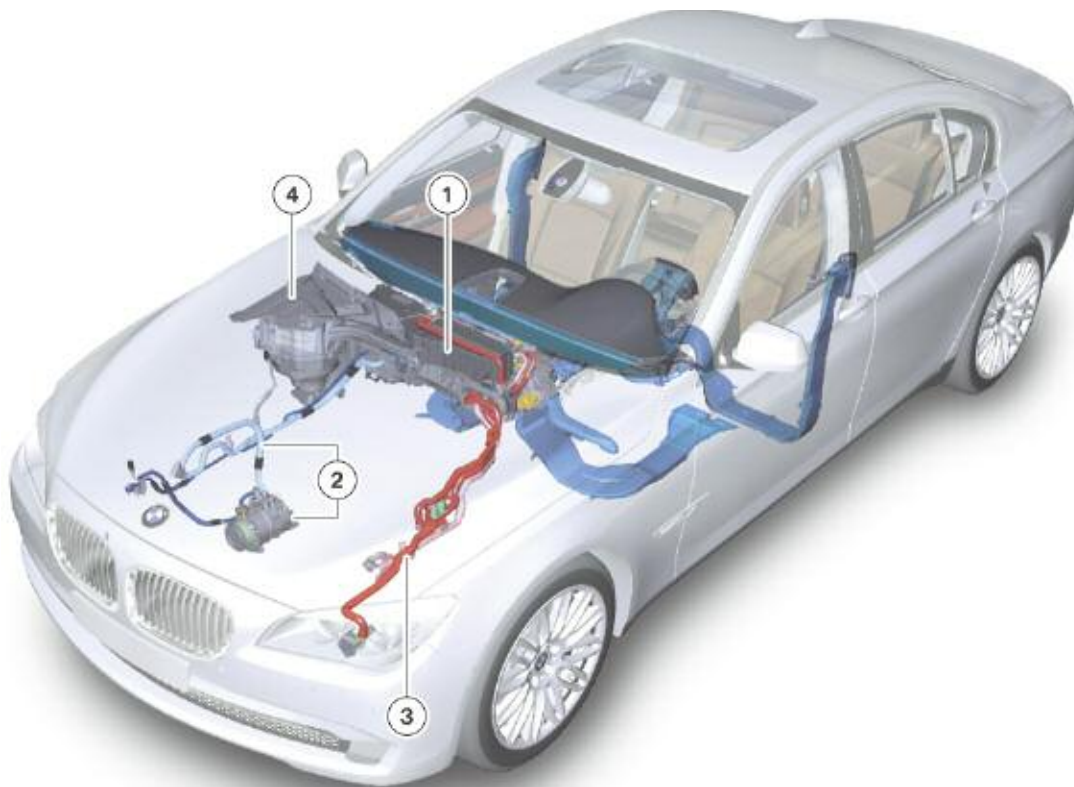
The power supply for operating the air ionizer is through a three-pin connector on the climate control wiring harness.

Communication with the IHKA control panel takes place by means of a control signal via a bidirectional cable connection.

IHKA Components

To optimize the system package, promote comfort and reduce noise level in the passenger compartment, the blower fan for the climate control system has now been placed in the engine compartment.

Main Components of the F01/F02 Climate Control System



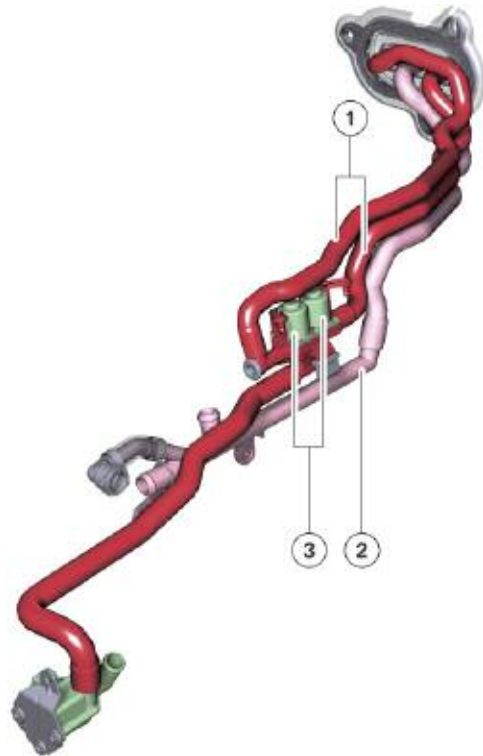
Index	Explanation	Index	Explanation
1	F01/F02 climate control system	3	Coolant pipes and double solenoid valves for the heater core
2	A/C compressor with intake and pressure lines	4	Fan for climate control system with fresh-air intake in engine compartment

Coolant Circuit of the Heating System

The F01/F02 IHKA system is a coolant regulated system. The coolant circuit uses a double solenoid heater control valve to control the temperature of the heater core.

Note: The N63 engine uses a mechanical water pump.

Index	Explanation
1	Flow pipes to heater matrix
2	Return pipe
3	Double solenoid valves for controlling the heater core temperature



Refrigerant Circuit

The refrigerant used on the F01/F02 is R134a.

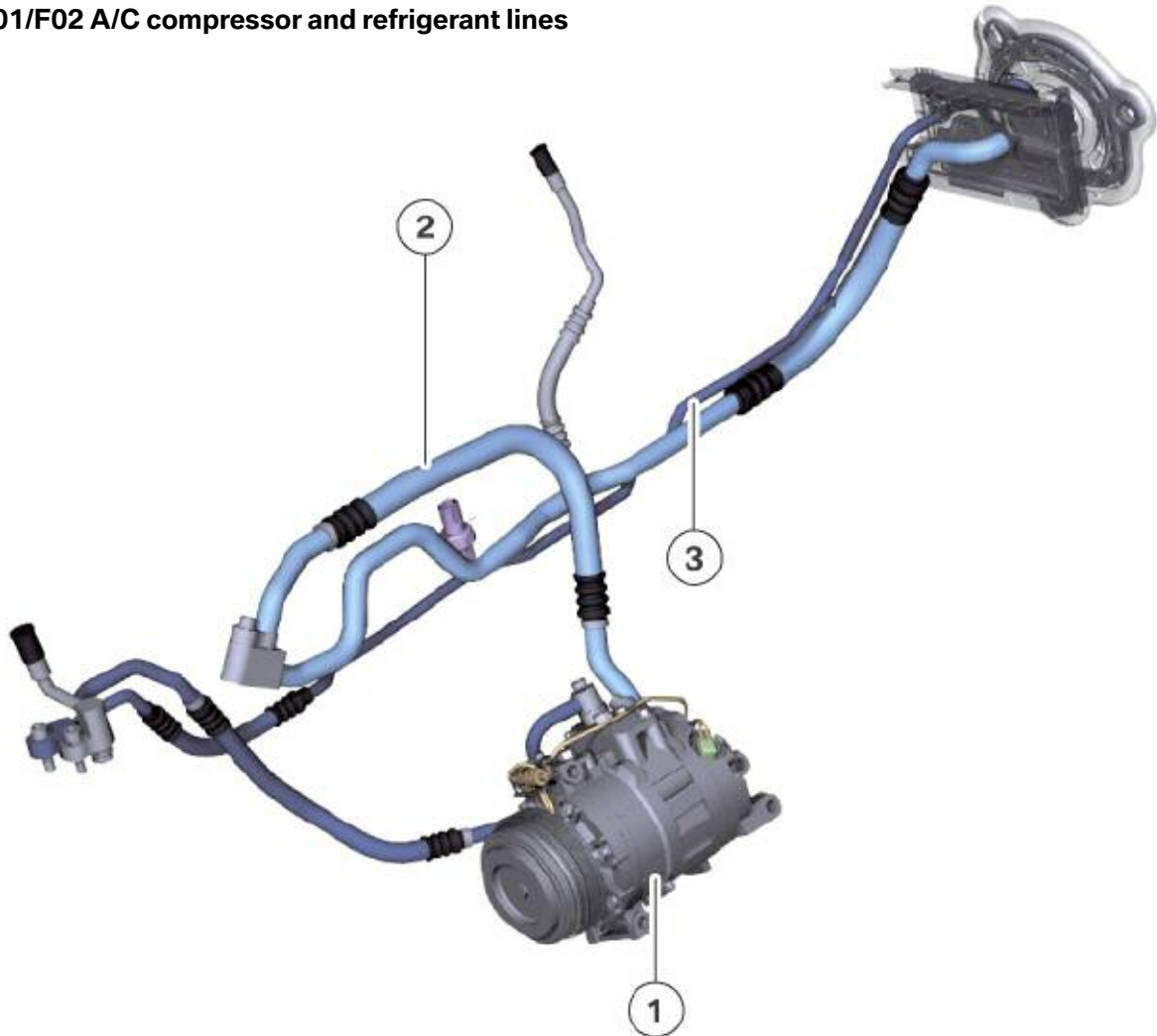


Index	Explanation
1	Example of information plate in engine compartment of F01
2	Details of refrigerant and quantity used

Main AC Components

The A/C compressor location and refrigerant lines routing in engine compartment.

F01/F02 A/C compressor and refrigerant lines

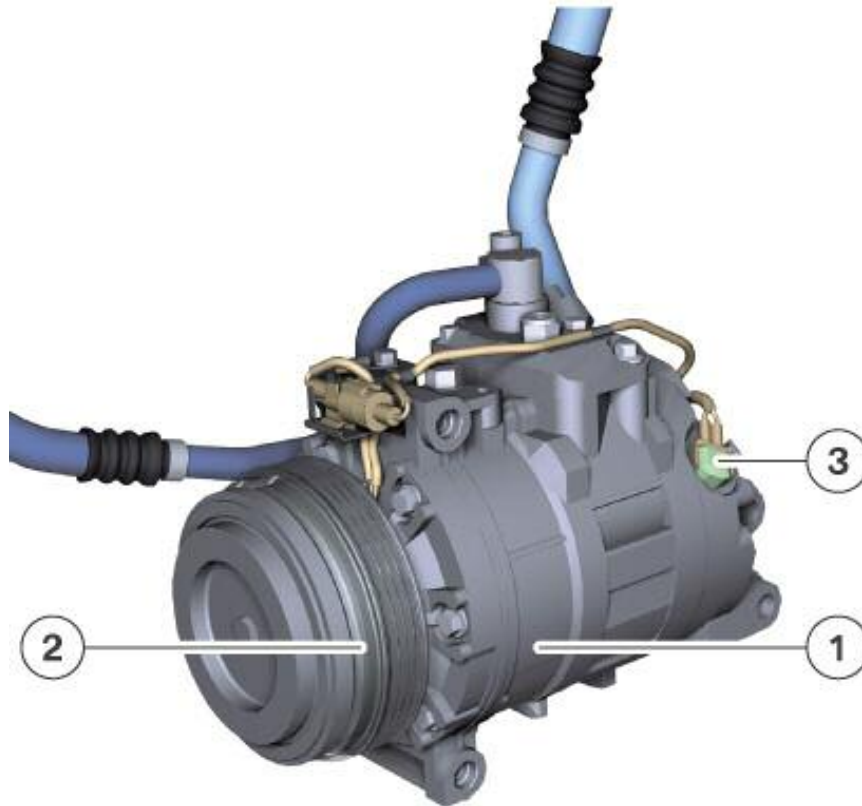


Index	Explanation	Index	Explanation
1	A/C compressor	3	Refrigerant circuit pressure line with pressure sensor
2	Refrigerant circuit intake line		

A/C Compressor

The system uses a variable displacement AC compressor with a magnetic clutch. Refrigerant pressure and flow are varied as the displacement of the compressor changes in response to the electronic control valve.

F01/F02 A/C Compressor

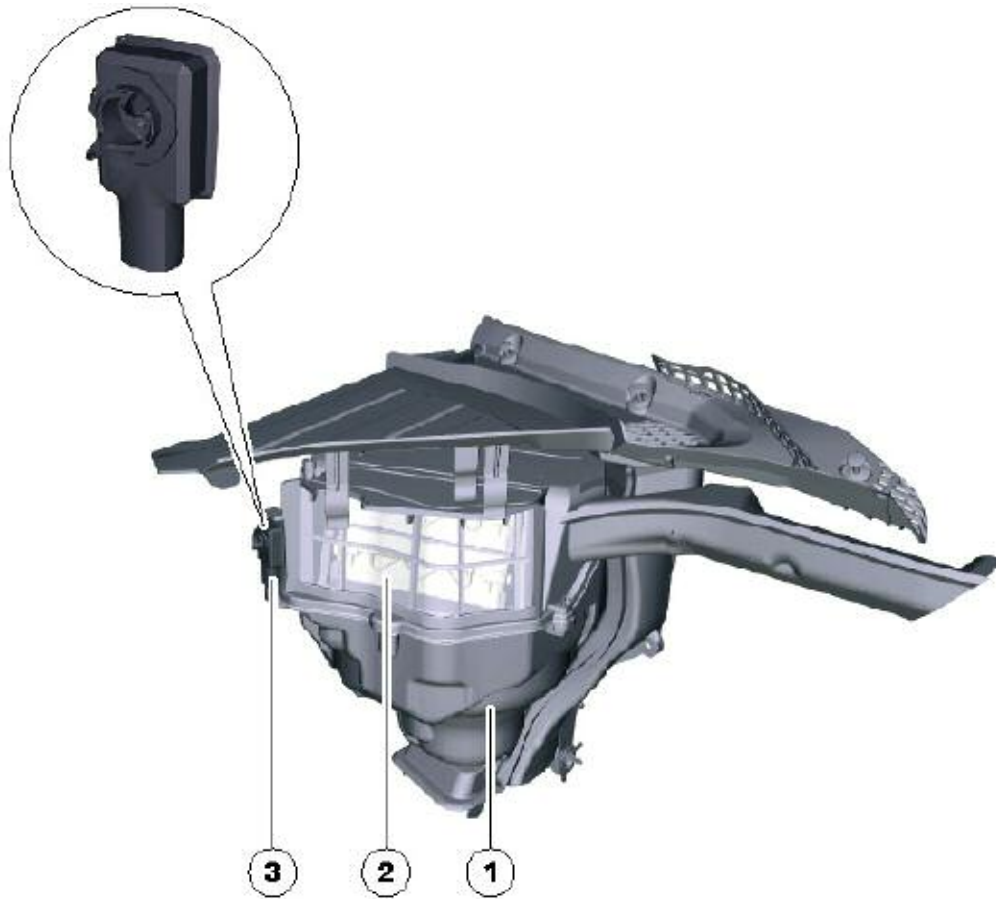


Index	Explanation	Index	Explanation
1	A/C compressor	3	Electronic control valve
2	A/C compressor magnetic clutch		

AUC Sensor

The AUC sensor is located next to the fresh air intake. The fresh air is drawn in through the cowl between windshield and hood and passes through a coarse filter in the climate control fan housing before entering the system.

Climate control system fan on F01/F02



Index	Explanation	Index	Explanation
1	Climate control system fan	3	AUC sensor
2	Coarse filter and fresh-air intake		

IHKA Front Control Unit Panel

The control panel and control unit of the climate control system on the F01/F02 is incorporated in the audio systems control panel.



The driver and front passenger can select separate automatic programs.

In order to be able to cater for the different heating/air conditioning preferences the automatic mode on the F01/F02 climate control offers a choice of 5 different levels of intensity for the automatic program.

Automatic mode is activated by pressing the AUTO button.

The intensity level is selected by repeatedly pressing the “Fan speed” rocker button when Automatic mode is active.

The “ALL” button can be used to synchronize the temperature, AUTO mode intensity or air flow rate and airflow distribution settings for all 4 zones with the settings for the driver.

The Residual feature is similar to the E70 in that it is operated by pressing the HIGH side of the driver’s fan speed button.

Some of the possible control scenarios on the control panels of the climate control systems are illustrated below.

Control scenarios on control panels of F01/F02 climate control systems

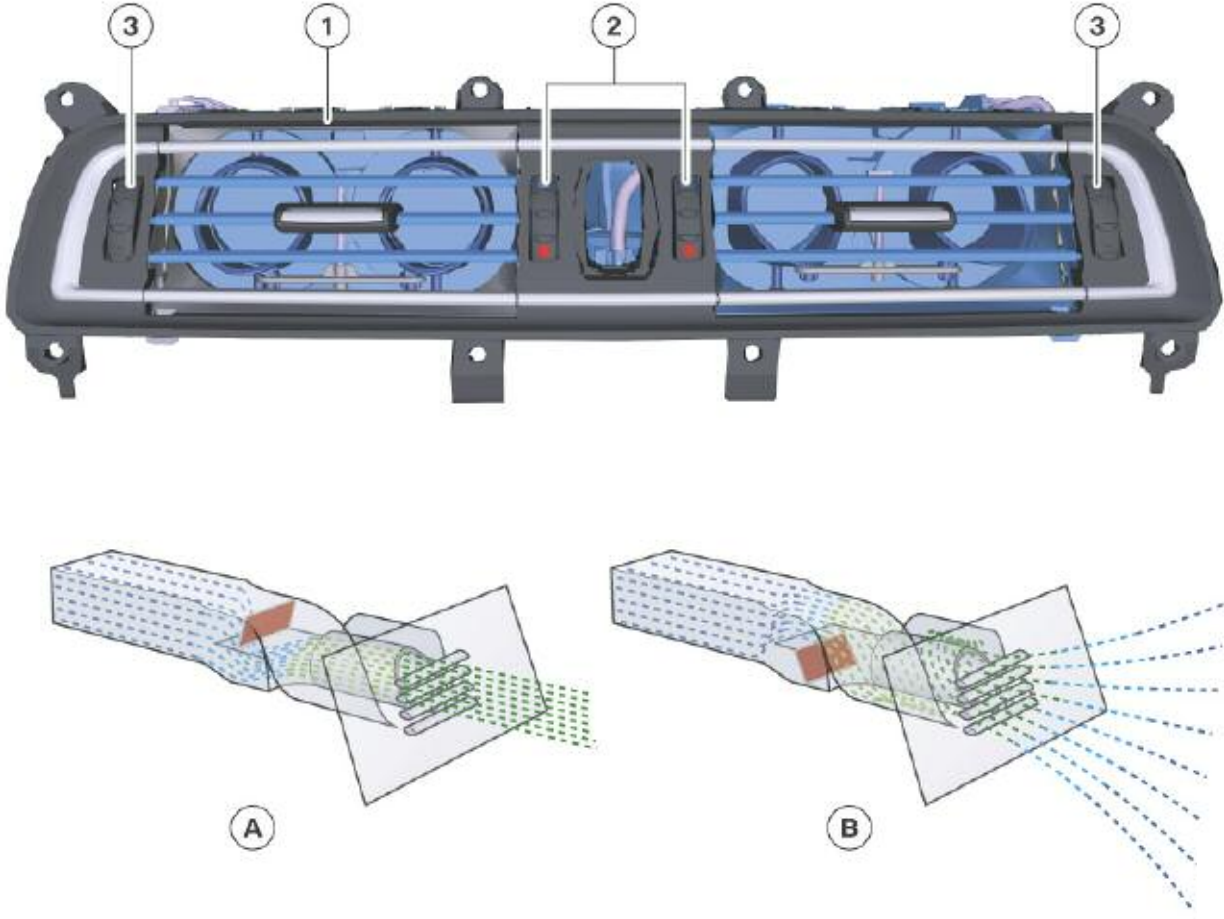


Index	Explanation	Index	Explanation
1	IHKA control panel, Automatic mode for driver and front passenger	3	IHKA control panel, Automatic mode for driver, climate control off for front passenger
2	IHKA control panel, Automatic mode for driver, manual mode for front passenger		

Front Center Air Vent

The front center air vent has a variable airflow focus feature that allows the airflow to be individually varied between spot-focussed and diffused mode settings.

Front center air vent with variable airflow focus on F01/F02



Index	Explanation	Index	Explanation
1	Front center fresh-air vent	A	Spot-focussed airflow setting
2	Front center airflow stratification controls	B	Diffused airflow setting
3	Spot/diffuser airflow adjusters		

Front center air vent with variable airflow focus on F01/F02



Index	Explanation	Index	Explanation
1	Left/right airflow stratification potentiometer and illumination	3	Left/right limit switch
2	Left/right adjuster illumination		

Left/right Side Air Vent



Index	Explanation
1	Adjuster and illumination
2	Limit switch



Left/right side air vent on F01/F02

Left/right B-pillar Air Vent



Index	Explanation
1	Adjuster and illumination



Left/right B-pillar air vent on F01/F02

FKA Rear Control Unit Panel

The 4-zone system has four control points for individually adjusting the climate control settings.

The rear passengers can adjust the temperature separately for the left and right sides.

The automatic program with its 5 intensity settings can also be selected in the rear seats.

As for the front seats, the intensity level in automatic mode for the rear passengers is selected and set by pressing the fan rocker button.



Index	Explanation	Index	Explanation
1	Control panel for FKA climate control set to automatic mode	2	Control panel for FKA climate control set to manual mode

Rear Center Air Vent

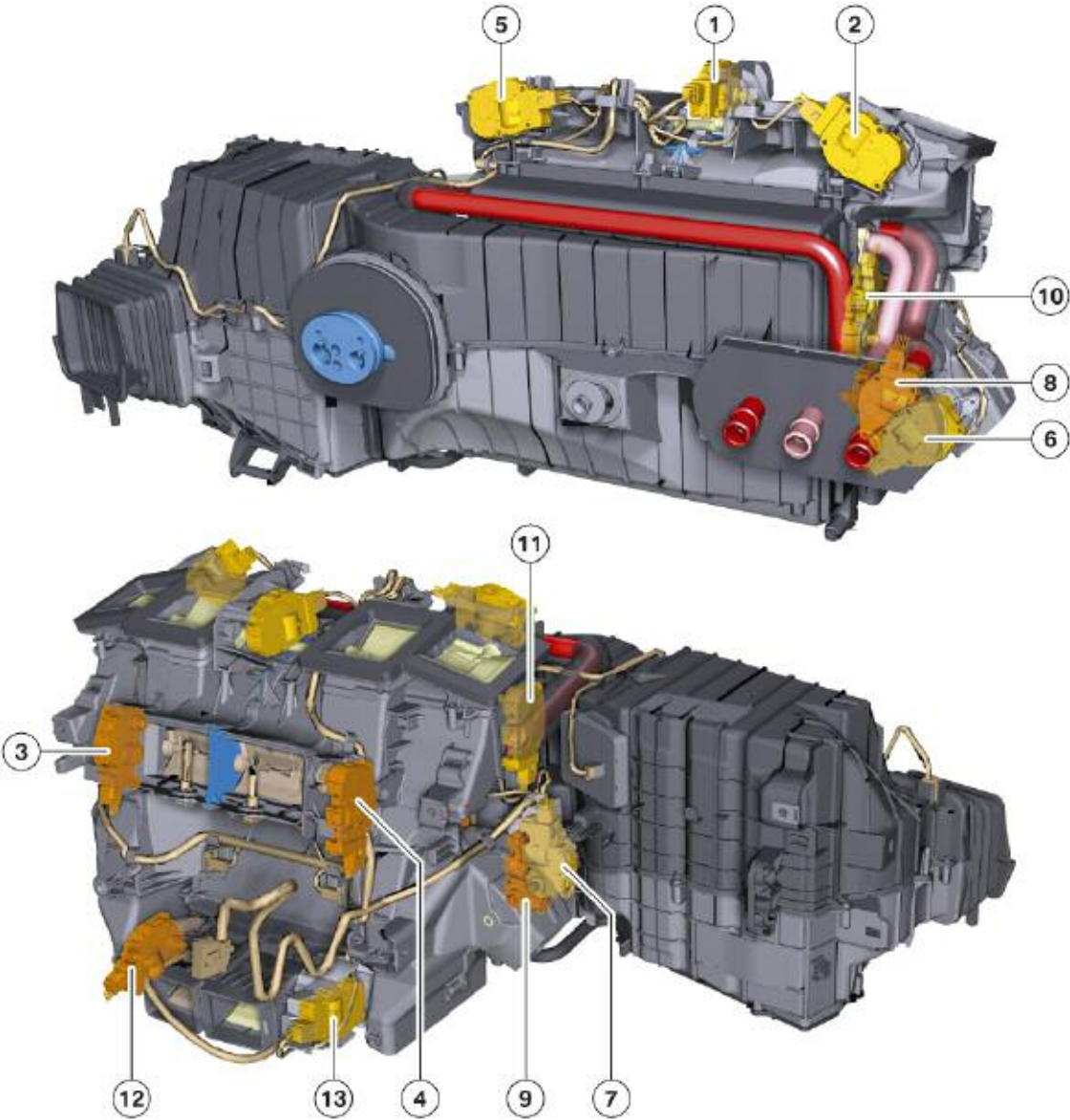


Index	Explanation	Index	Explanation
1	Rear center air vent left/right airflow stratification potentiometer	3	Temperature sensor
2	Adjuster with illumination		

IHKA Stepper Motors

The IHKA 4 zone has a total of 15 stepper motors for automatic airflow distribution.

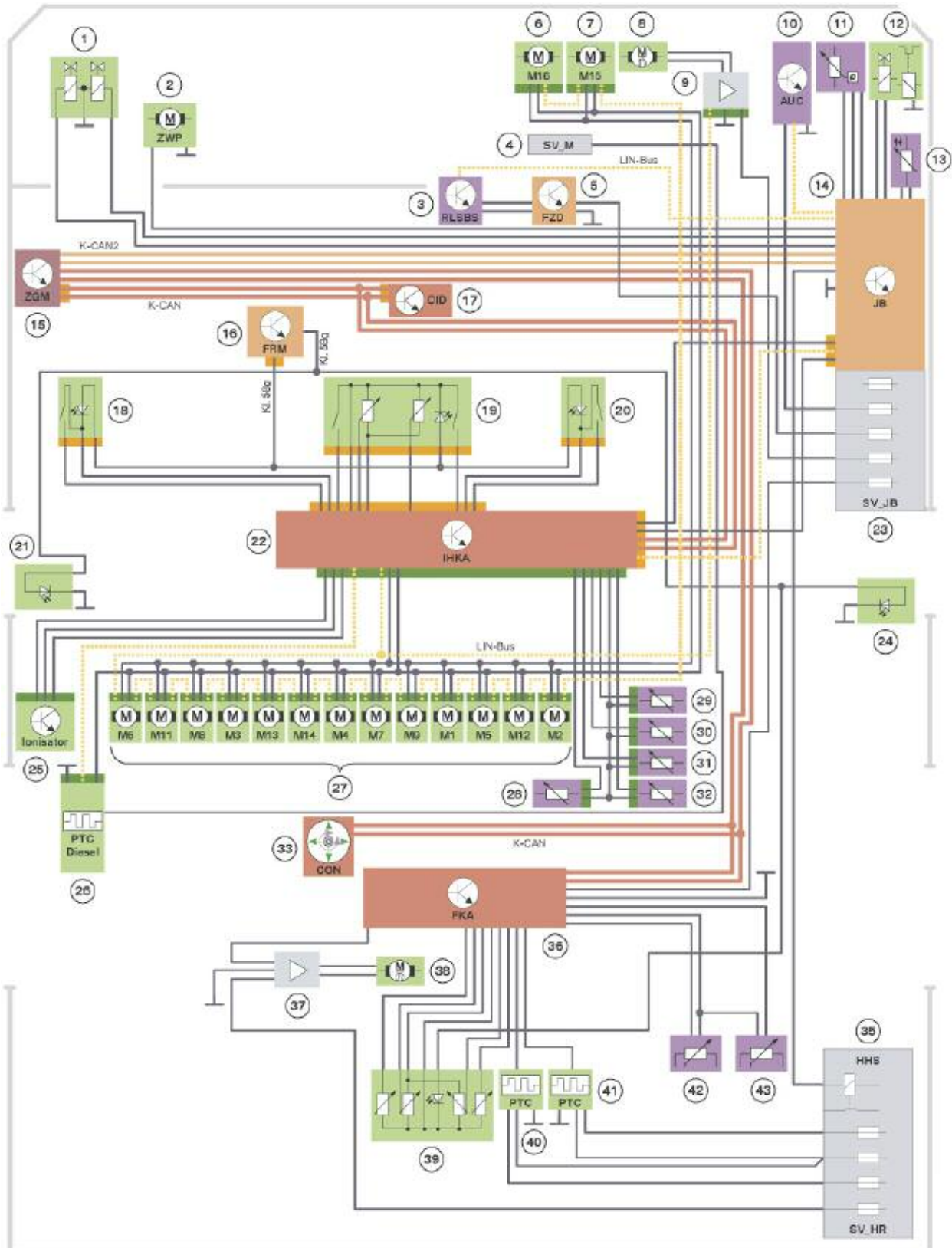
IHKA Stepper Motor Locations



IHKA Stepper Motors Location Legend

Index	Explanation
1	Stepper motor for defroster
2	Stepper motor for left outer air vent
3	Stepper motor for left center air vent
4	Stepper motor for right center air vent
5	Stepper motor for right outer air vent
6	Stepper motor for left front footwell
7	Stepper motor for right front footwell
8	Stepper motor for left rear footwell
9	Stepper motor for right rear footwell
10	Stepper motor for left front stratified airflow
11	Stepper motor for right front stratified airflow
12	Stepper motor for left rear stratified airflow
13	Stepper motor for right rear stratified airflow
14	Stepper motor for recirculated air (on fan motor housing)
15	Stepper motor for fresh/ram air (on fan motor housing)

IHKA (4 Zone) Circuit Diagram



Index	Explanation
1	Double solenoid valves for coolant supply to heater matrix, left/right
2	Electric auxiliary water pump (ZWP)
3	IHKA 4 zone: rain/light/solar/condensation sensor (RLBSS)
4	Not for US
5	Roof Function Center (FZD)
6	Servo motor for fresh air/ram air on air fan in engine compartment
7	Servo motor for recirculated air on air fan in engine compartment
8	Fresh air/recirculated air fan motor
9	Output stage for fresh air/recirculated air fan motor
10	AUC sensor for automatic recirculated air control
11	High-pressure sensor for air conditioner refrigerant circuit
12	Air-conditioning compressor with magnetic clutch and control valve
13	Outside temperature sensor
14	Junction Box electronics (JB)
15	Central Gateway Module (ZGM)
16	Footwell module (FRM), Terminal 58g
17	Central Information Display (CID)
18	IHKA 4 zone: left side vent limit switch and illumination
19	IHKA front center air vent, left/right airflow stratification potentiometer, left/right limit switch and illumination
20	IHKA 4 zone: right side vent limit switch and illumination
21	Left B-pillar vent illumination
22	Heating and air conditioning system/audio control panel IHKA control panel and control unit with interior temperature sensor

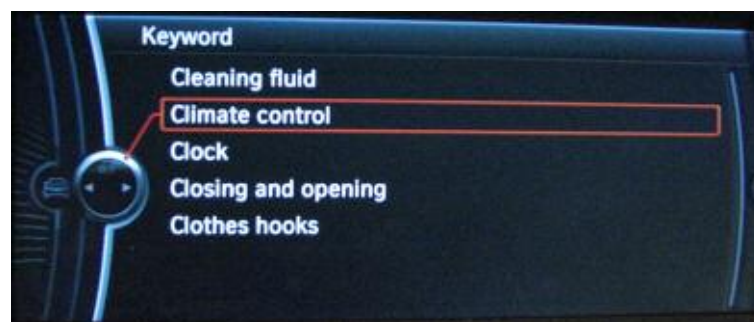
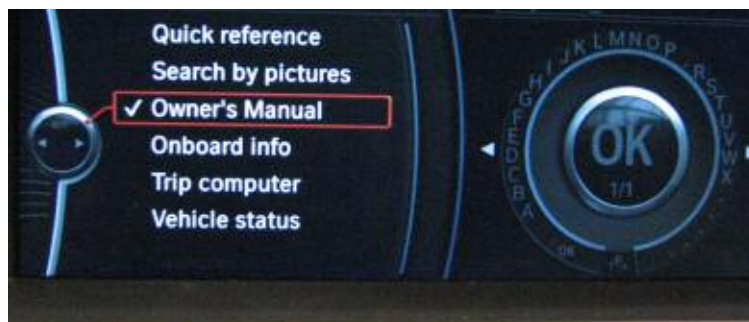
Index	Explanation
23	Front power distribution box
24	Right B-pillar vent illumination
25	Air ionizer on climate-control unit
26	Not for US
27	Stepper motors for automatic airflow distribution on climate-control unit IHKA 4 zone: fifteen stepper motors
28	Air temperature sensor, front center left
29	Air temperature sensor, front center right
30	Left heater matrix temperature sensor
31	Right heater matrix temperature sensor
32	Evaporator temperature sensor
33	Controller
34	Not for US
35	Rear right power distribution box with HHS relay
36	IHKA FKA control panel and control unit with interior temperature sensor
37	IHKA 4 zone: output stage for FKA center-console fan
38	IHKA 4 zone: FKA center-console fan
39	IHKA rear center air vent, left/right airflow stratification potentiometer, left/right temperature sensor and adjuster illumination
40	IHKA w/ FKA: PTC heater element in rear left footwell vent duct
41	IHKA w/ FKA: PTC heater element in rear right footwell vent duct
42	IHKA w/ FKA: temperature sensor in rear left footwell vent duct
43	IHKA w/FKA: temperature sensor in rear right footwell vent duct

The F01/F02 introduces the interactive vehicle owner's manual. It provides extensive information on system operation, function, configuration and performance.

The information can be accessed via the main menu.

- Main menu > (1)
 - Vehicle info > (2)
 - Owner's Manual > (3)
 - Keyword search > (4)
 - Climate Control > (5)

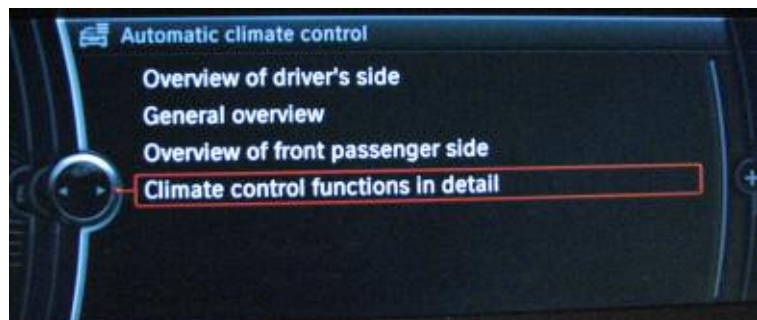
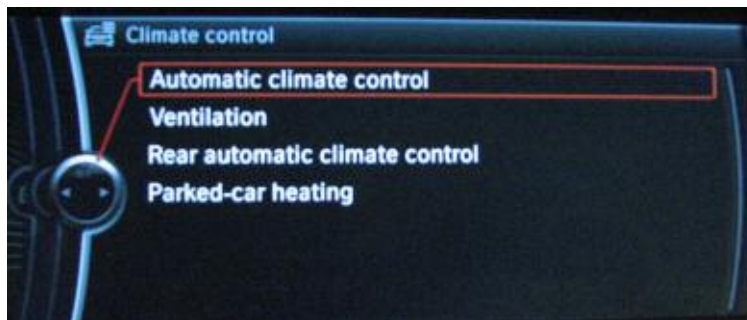
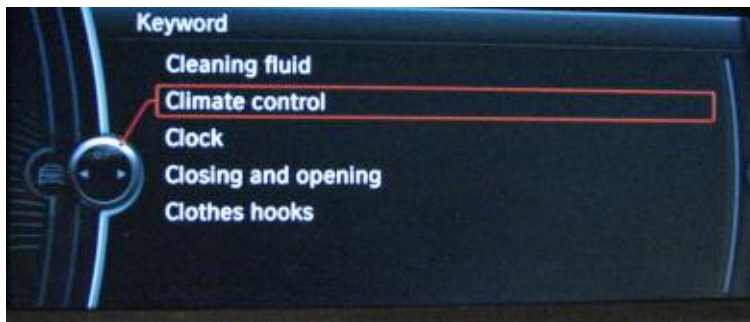
Interactive Owner's Manual on F01/F02



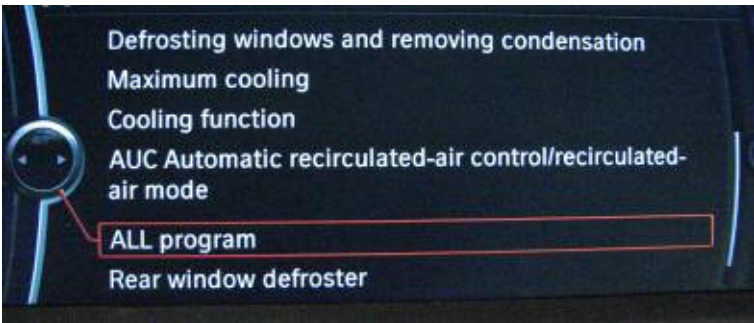
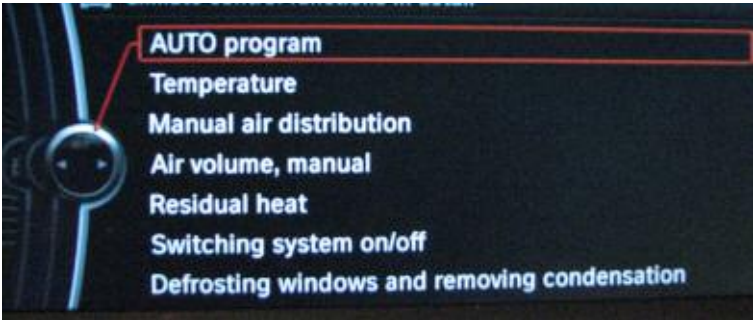
Extensive information is provided on the subject of air conditioning/climate control.

- Keyword search > (1)
 - Climate control (2)
 - Automatic climate control > (3)
 - Climate control functions in detail > (4)

Interactive Owner's Manual on F01/F02 climate control functions

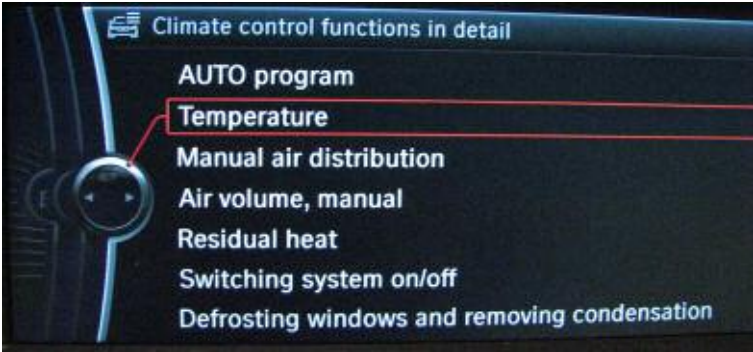


Interactive Owner's Manual on F01/F02 climate control functions



Index	Explanation	Index	Explanation
1	Climate control functions in detail	3	ALL program
2	AUTO program		

Interactive Owner's Manual on F01/F02 climate control functions



Index	Explanation	Index	Explanation
1	Climate control functions in detail	3	Adjusting temperature
2	Temperature		

- Main menu > (1)
 - Settings > (2)
 - Air conditioning > (3)
 - Rear air conditioning > (4)

Accessing air conditioning settings from main menu



Service Information

The following charts show the different systems/user functions and components used in the climate control systems of the F01/F02.

System Functions	IHKA/ FKA
IHKA Control Unit	X
FKA Control Unit	X
HKA Control Unit	
Control and adjustment points	4
Temperature zones	4
Air flow rate zones	4
Airflow distribution zones	4
AUTO programs with 5 intensity levels	3
Front Airflow stratification	2
Rear Airflow stratification	2
Air ionizer for evaporator disinfection	X

User functions	IHKA/ FKA
Variable airflow focus	X
Fresh air/recirculated air function, AUC	X
Cold start interlock	X
Start anti-misting	X
Anti-misting	X
Defrost	X
Max heating	X
Max cooling	X
Max A/C	X
Solar compensation	X
Residual heat	X
ALL function, 4 zones	X
OFF function	X
Rear OFF function	X
A/C compressor function manual cut-out	X

Sensor system	IHKA/ FKA
Front interior temperature sensor (IHKA)	X
Rear interior temperature sensor (FKA)	X
Evaporator temperature sensor	1
Refrigerant pressure sensor junction box electronics, JB	X
Heater matrix temperature sensor	2
Air outlet temperature sensor	6
AUC sensor, JB	X
Solar sensor	X
Condensation sensor	X